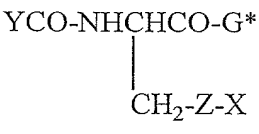
What is claimed is:

1. A method to stimulate hematopoiesis, protect hematopoietic cells from damage caused by radiation or chemotherapy, or potentiate the stimulatory action of one or a combination of cytokines on colony formation by hematopoietic progenitor cells, which method comprises contacting bone marrow or peripheral blood or fractions thereof with a diester of a compound of the formula:



A

wherein:

each ester is 1-25C;

YCO is γ-glu or β-asp;

G* is phenylglycine;

Z is CH_2, O or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;

or a pharmaceutically acceptable salt thereof;

in an amount and for a time effective to stimulate hematopoiesis, protect said hematopoietic cells from said damage, or potentiate said stimulatory action of said cytokine or cytokines, in said bone marrow, peripheral blood, or fraction.

2. The method of claim 1 wherein YCO is γ-glu, and Z is S.

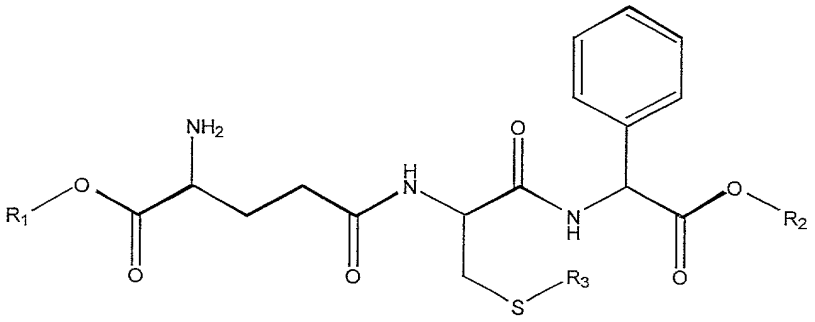
3. The method of claim 2 wherein at least one ester is a 10 to 25C ester.

4. The method of claim 1 wherein the compound has a greater lipophilicity than a corresponding diethyl ester.

5. The method of claim 1 wherein the compound is formulated as a lipid composition.

6. The method of claim 4 wherein the compound is formulated as a lipid composition.

7. The method of claim 1 wherein the compound is of the formula:



Formula I

wherein:

R1 and R2 are independently chosen from linear or branched alkyl (1-25C), cycloalkyl (6-25C), heterocycles (6-20C), ethers or polyethers (3-25C), or where R1-R2 together have 2-20C atoms and form a macrocycle with the remainder of formula I; and wherein R3 is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;
or a pharmaceutically acceptable salt thereof.

8. The method of claim 7 wherein R3 is benzyl.

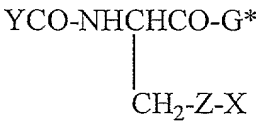
9. The method of claim 7 wherein R1 and R2 each has from 10 to 25C.

10. The method of claim 1 wherein said contacting is effected by administering said compound or a pharmaceutical composition thereof to a subject in need of said stimulating, protecting or potentiating, in an amount

effective to stimulate said hematopoiesis, protect said hematopoietic cells from said damage, or potentiate said action of said cytokines.

11. The method of claim 10 wherein said subject is a human.

12. A method to protect a subject from a destructive effect of a chemotherapeutic agent or irradiation, which method comprises administering a diester of a compound of the formula:



A

wherein:

each ester is 1-25C;

YCO is γ-glu or β-asp;

G* is phenylglycine;

Z is CH_2, O or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;

or a pharmaceutically acceptable salt therof;

to said subject in an amount and for a time effective to exert said protective effect.

13. The method of claim 12 wherein YCO is γ-glu, and Z is S.

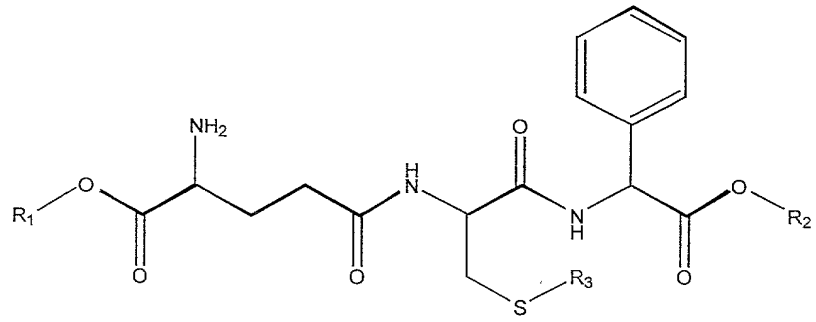
14. The method of claim 13 wherein at least one ester is a 10 to 25C ester.

15. The method of claim 12 wherein the compound has a greater lipophilicity than a corresponding diethyl ester.

16. The method of claim 12 wherein the compound is formulated as a lipid composition.

17. The method of claim 15 wherein the compound is formulated as a lipid composition.

18. The method of claim 7 wherein the compound is of the formula:



Formula I

wherein:

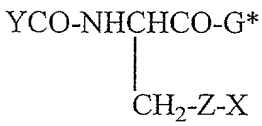
R1 and R2 are independently chosen from linear or branched alkyl (1-25C), cycloalkyl (6-25C), heterocycles (6-20C), ethers or polyethers (3-25C), or where R1-R2 together have 2-20C atoms and form a macrocycle with the remainder of formula I; and wherein R3 is benzyl or naphthyl;

or a pharmaceutically acceptable salt thereof.

19. The method of claim 18 wherein R3 is benzyl.

20. The method of claim 18 wherein R1 and R2 each has from 10 to 25C.

21. A method to potentiate the effect of a chemotherapeutic agent administered to a subject, which method comprises administering a diester of a compound of the formula:



A

wherein:

each ester is 1-25C;

YCO is γ-glu or β-asp;

G* is phenylglycine;

Z is CH_2, O or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;

or a pharmaceutically acceptable salt thereof;

to said subject in an amount and for a time effective to exert said protective effect.

22. The method of claim 21 wherein YCO is γ-glu, and Z is S.

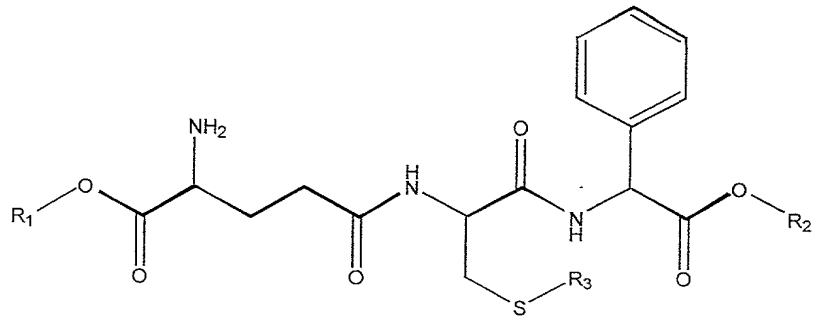
23. The method of claim 22 wherein at least one ester is a 10 to 25C ester.

24. The method of claim 21 wherein the compound has a greater lipophilicity than a corresponding diethyl ester.

25. The method of claim 21 wherein the compound is formulated as a lipid composition.

26. The method of claim 24 wherein the compound is formulated as a lipid composition.

27. The method to potentiate the effect of a chemotherapeutic agent administered to a subject, which method comprises administering a compound of the formula:



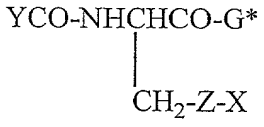
Formula I

wherein:

R1 and R2 are independently chosen from linear or branched alkyl (1-25C), cycloalkyl (6-25C), heterocycles (6-20C), ethers or polyethers (3-25C), or where R1-R2 together have 2-20C atoms and form a macrocycle with the remainder of formula I; and wherein R3 is benzyl;
or a pharmaceutically acceptable salt thereof.

28. The method of claim 27 wherein R1 and R2 each has from 10 to 25C.

29. A pharmaceutical composition comprising a compound of the formula:



A

or the ester, amide, ester/amide or salt forms thereof, wherein:

YCO is γ-glu or β-asp;

G* is phenylglycine or glycine;

Z is CH_2, O or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;
or a pharmaceutically acceptable salt thereof.

30. A pharmaceutical composition according to claim 29 wherein the compound is a diester.

31. A pharmaceutical composition according to claim 30 wherein YCO is γ-glu, G is phenylglycine, and Z is S.

32. A pharmaceutical composition according to claim 31 wherein each ester is a 1 to 25C ester.

33. A pharmaceutical composition according to claim 31 wherein at least one ester is a 10 to 25C ester.

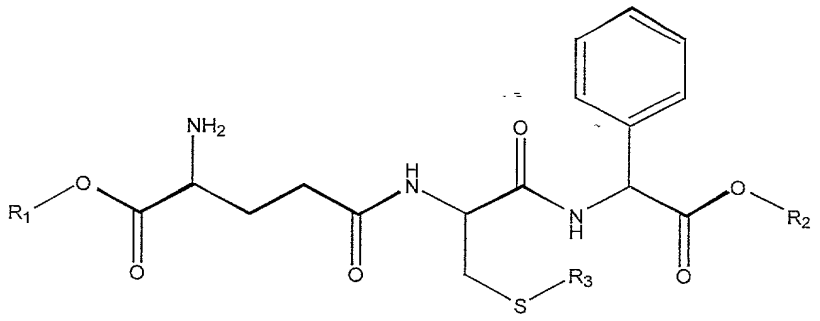
34. A pharmaceutical composition according to claim 31 wherein the compound has a greater lipophilicity than a corresponding diethyl ester.

35. A pharmaceutical composition according to claim 31 wherein the compound is less subject to hydrolysis in human blood than a corresponding diethyl ester.

36. A pharmaceutical composition according to claim 29 wherein the compound is formulated as a lipid composition.

37. A pharmaceutical composition according to claim 34 wherein the compound is formulated as a lipid composition.

38. A pharmaceutical composition according to claim 30 wherein the compound is of the formula:



Formula I

wherein:

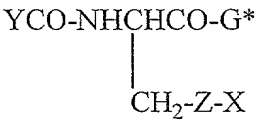
R1 and R2 are independently chosen from linear or branched alkyl (1-25C), cycloalkyl (6-25C), heterocycles (6-20C), ethers or polyethers (3-25C), or where R1-R2 together have 2-20C atoms and form a macrocycle with the remainder of formula I; and wherein R3 is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;
or a pharmaceutically acceptable salt thereof.

39. A pharmaceutical composition according to claim 38 wherein R3 is benzyl.

40. A pharmaceutical composition according to claim 30 wherein the diester exhibits enhanced potentiation of chlorambucil cytotoxicity on human cells in comparison with the corresponding free di-acid form of the compound.

41. A pharmaceutical composition according to claim 30 wherein the diester provides enhanced differentiation of mouse or rat bone marrow in comparison with the corresponding free di-acid form of the compound.

42. The use of a compound of formula A



A

wherein:

each ester is 1-25C;

YCO is γ-glu or β-asp;

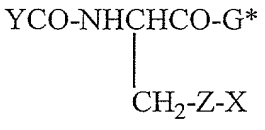
G* is phenylglycine;

Z is CH_2, O or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;
or a pharmaceutically acceptable salt thereof;

in the preparation of a pharmaceutical composition of any one of claims 29 to 41.

43. A lipid formulation containing a compound of the formulae A



A

wherein:

each ester is 1-25C;

YCO is γ-glu or β-asp;

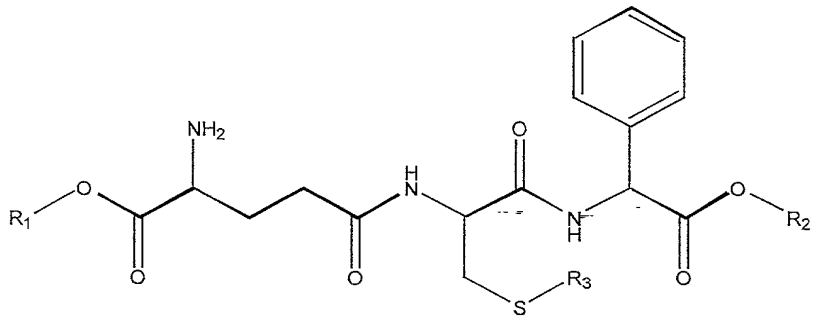
G* is phenylglycine;

Z is CH_2, 0 or S; and

X is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl;

or a pharmaceutically acceptable salt thereof;

or I



Formula I

wherein:

R1 and R2 are independently chosen from linear or branched alkyl (1-25C), cycloalkyl (6-25C), heterocycles (6-20C), ethers or polyethers (3-25C), or where R1-R2 together have 2-20C atoms and form a macrocycle with the remainder of formula I; and wherein R3 is a hydrocarbon radical selected from the group consisting of 6-8C alkyl, benzyl, and naphthyl; or a pharmaceutically acceptable salt thereof;

to facilitate the compound's uptake and to increase its bioavailability.

44. The lipid formulation of claim 43 which comprises a liposome composition for use in the modulation of hematopoiesis and protection against the destructive effects of chemotherapy, comprising liposomes being composed of vesicle-forming lipids, containing a compound of formulae A or I or a pharmaceutically acceptable salt thereof in a liposome-entrapped form, and being characterized as:

(i) composed of naturally occurring phospholipids; and

(ii) at least 50% degree of encapsulation of the compound; and

(iii) an average size of 50-2000 nm; and

(iv) a net negative charge.

45. The formulation of any one of claims 43 and 44, wherein at least 50% of the compound of formulae A or I or a pharmaceutically acceptable salt thereof is in liposome-entrapped form, preferably above 80%.

46. The formulation of any one of claims 43 to 45 which comprises by weight a ratio of lipid to compound of formulae A or I or a pharmaceutically acceptable salt thereof ranging from 3:1 to 6:1, preferably 3.5-4.5:0.5-1.5.

47. The formulation of any one of claims 43 to 46, comprising liposomes having an average size ranging between 50 and 2000 nm, preferably 400-600 nm.

48. The formulation of any one of claims 43 to 47, comprising liposomes having a net charge ranging from negative to neutral, preferably negative.

49. The formulation of any one of claims 43 to 48 characterized by increased solubility of the compound of formulae A or I or a pharmaceutically acceptable salt thereof when administered parenterally and decreased toxicity.

50. The formulation of any one of claims 43 to 49, wherein the vesicle-forming lipids are 2 different naturally occurring phospholipids in a ratio ranging from 1:3 to 3:1, preferably in a ratio of 0.75-1.25:0.75-1.25.

51. The formulation of any one of claims 43 to 50, wherein the vesicle-forming lipids are egg phosphatidylcholine (EPC) and egg phosphatidylglycerol (EPG) in a ratio ranging from 1:3 to 3:1, preferably in a ratio of 0.75-1.25:0.75-1.25.

52. The formulation of any one of claims 43 to 51, comprising liposomes composed by weight of 2 parts EPC, 2 parts EPG, 1 part compound of formulae A or I or a pharmaceutically acceptable salt thereof, and 7 parts sucrose.

53. A method of modulating hematopoiesis and protecting against the destructive effects of chemotherapy, comprising entrapping the compound of formulae A or I as defined in claims 1 and 7 or a pharmaceutically acceptable salt thereof in liposomes characterized by:

(i) composed of naturally occurring phospholipids; and

(ii) at least 50% degree of encapsulation of the compound in the liposome;

(iii) an average size of 50-2000 nm; and

(iv) a net negative charge.

54. The method of modulating hematopoiesis and protecting against the destructive effects of chemotherapy according to claim 53, comprising entrapping the compound of formulae

A or I or a pharmaceutically acceptable salt thereof in liposomes characterized by:

(i) composed of EPC and EPG in a ratio of 0.75-1.25:0.75-1.25; and

(ii) at least 80% degree of encapsulation of the compound in the liposome;

(iii) an average size of 400-600 nm; and

(iv) a net negative charge.

55. A method of administering the formulation of any one of claims 43 to 52 to modulate hematopoiesis and protect against the destructive effects of chemotherapy.

56. The use of the formulation of any one of claims 43 to 52 for the incorporation of a compound of formulae A or I or a pharmaceutically acceptable salt thereof for the modulation of hematopoiesis and protection against the destructive effects of chemotherapy.

57. The lipid formulation according to claim 44 for use in the modulation of hematopoiesis and protection against the destructive effects of chemotherapy, comprising liposomes being composed of vesicle-forming lipids, containing γ-Glutamyl-S(benzyl)cysteinyl-R-phenyl glycine diethyl ester or a pharmaceutically acceptable salt thereof in a liposome-entrapped form, and being characterized as:

(i) composed of naturally occurring phospholipids; and

(ii) at least 50% degree of encapsulation of the compound; and

(iii) an average size of 50-2000 nm; and

(iv) a net negative charge.

58. A method of modulating hematopoiesis and protecting against the destructive effects of chemotherapy according to claim 53, comprising entrapping γ-Glutamyl-S(benzyl)cysteinyl-R-phenyl glycine diethyl ester or a

pharmaceutically acceptable salt thereof in liposomes characterized by:

(i) composed of naturally occurring phospholipids; and

(ii) at least 50% degree of encapsulation of the compound in the liposome;

(iii) an average size of 50-2000 nm; and

(iv) a net negative charge.

59. A method of modulating hematopoiesis and protecting against the destructive effects of chemotherapy according to claim 58, comprising entrapping γ-Glutamyl-S(benzyl)cysteinyl-R-phenyl glycine diethyl ester or a pharmaceutically acceptable salt thereof in liposomes characterized by:

(i) composed of EPC and EPG in a ratio of 0.75-1.25:0.75-1.25; and

(ii) at least 80% degree of encapsulation of the compound in the liposome;

(iii) an average size of 400-600 nm; and

(iv) a net negative charge.

60. The use of the formulation of any one of claims 43 to 52 for the incorporation of γ-Glutamyl-S(benzyl)cysteinyl-R-phenyl glycine diethyl ester or a pharmaceutically acceptable salt thereof for the modulation of hematopoiesis and protection against the destructive effects of chemotherapy.